JEE MAIN 2023
Paper with Solution

CHEMISTRY | 30th Jan 2023 _ Shift-2

Umeed Rank Ki Ho Ya Selection Ki, JEET NISCHIT HAI!

Most Promising RANKS
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- AIR-1 to 10 — 25 Times
- AIR-11 to 50 — 83 Times
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JEE MAIN+ADVANCED

- AIR-1 to 10 — 8 Times
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Nation's Best SELECTION
Percentage (%) Ratio

Student Qualified in NEET

(2022)
4837/5356 = 90.31%
(2021)
3276/3411 = 93.12%

Student Qualified in JEE ADVANCED

(2022)
1756/4818 = 36.45%
(2021)
1256/2994 = 41.95%

Student Qualified in JEE MAIN

(2022)
4818/6653 = 72.41%
(2021)
2994/4087 = 73.25%

NITIN VIIJAY (NV Sir)
Founder & CEO

SECTION - A

31. The $Cl - Co - Cl$ bond angle values in a fac- $[Co(NH_3)_3Cl_3]$ complex is/are:

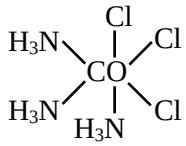
(1) 90°

(2) 90°&120°

(3) 180°

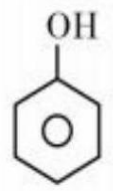
(4) 90°&180°

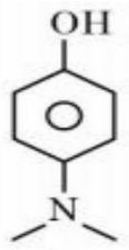
Sol. 1

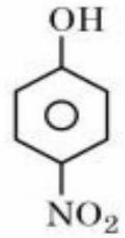


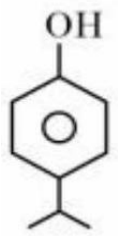
(90°)

32. The correct order of pK_a values for the following compounds is:

a 

b 

c 

d 

(1) c > a > d > b

(2) b > a > d > c

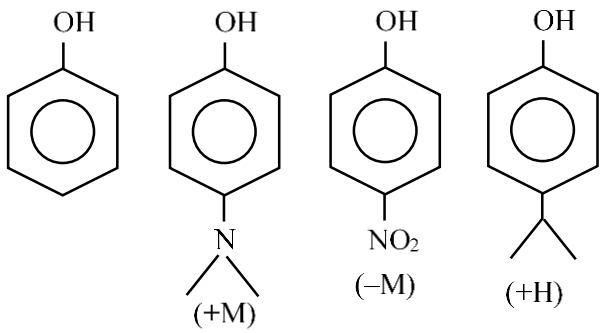
(3) $b > d > a > c$

(4) $a > b > c > d$

Sol. **3**

Acidic strength $\propto$ (–M, –H, – I)

$$\propto \frac{1}{(+M,+H,+I)}$$



$$PKa \propto \frac{1}{\text{Acidic}} \text{ strength}$$

A order of acidic strength: c > a > d > b

Order of PKa : c < a < d < b

33. Given below are two statements:

Statement I : During Electrolytic refining, the pure metal is made to act as anode and its impure metallic form is used as cathode.

Statement II : During the Hall-Heroult electrolysis process, purified Al_2O_3 is mixed with Na_3AlF_6 to lower the melting point of the mixture.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Statement I is correct but Statement II is incorrect

(2) Both Statement I and Statement II are incorrect

(3) Both Statement I and Statement II are correct

(4) Statement I is incorrect but Statement II is correct

Sol. **4**

Mixture of CaF_2 & Na_3AlF_6 decreasing the M.P. of Al_2O_3.

In electrolytic definning, pure metal is always deposited at the cathode

34. Match List I with List II:

List I (Mixture)		List II (Separation Technique)	
A.	$CHCl_3 + C_6H_5NH_2$	I.	Steam distillation
B.	$C_6H_{14} + C_5H_{12}$	II.	Differential extraction
C.	$C_6H_5NH_2 + H_2O$	III.	Distillation
D.	Organic compound in H_2O	IV.	Fractional distillation

(1) A-IV, B-I, C-III, D-II

(2) A-III, B-IV, C-I, D-II

(3) A-III, B-I, C-IV, D-II

(4) A-II, B-I, C-III, D-IV

Sol. **2**

A. $CHCl_3 + C_6H_5NH_2 \rightarrow$ Distillation (III)

B. $C_6H_{14} + C_5H_{12} \rightarrow$ fractional distillation (IV)

C. $C_6H_5NH_2 \rightarrow H_2O \rightarrow$ Steam distillation (I)

D. Organic compound in $H_2O \rightarrow$ Differential extraction (II)

35. 1 L, 0.02M solution of $[Co(NH_3)_5SO_4]Br$ is mixed with 1 L, 0.02M solution of $[Co(NH_3)_5Br]SO_4$. The resulting solution is divided into two equal parts (X) and treated with excess of $AgNO_3$ solution and $BaCl_2$ solution respectively as shown below:

1 L solution (X) + $AgNO_3$ solution (excess) $\rightarrow$ Y

1 L Solution (X)+$BaCl_2$ solution (excess) $\rightarrow$ Z

The number of moles of Y and Z respectively are

(1) 0.02, 0.01 (2) 0.01, 0.01

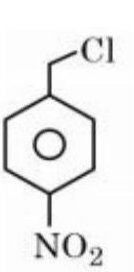
(3) 0.01, 0.02 (4) 0.02, 0.02

Sol. **2**

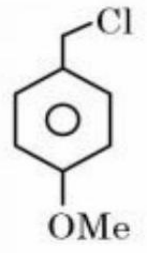
$$\underset{0.01\,mol}{\left[Co(NH_3)_5SO_4\right]}Br + \underset{excess}{AgNO_3} \rightarrow \underset{0.01\,mol}{AgBr}\downarrow$$

$$\underset{0.02\,mol}{\left[Co(NH_3)_5Br\right]}SO_4 + \underset{excess}{BaCl_2} \rightarrow \underset{0.01\,mol}{BaSO_4}\downarrow$$

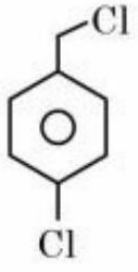
36. Decreasing order towards SN 1 reaction for the following compounds is:



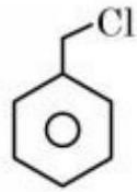
a



b



c



d

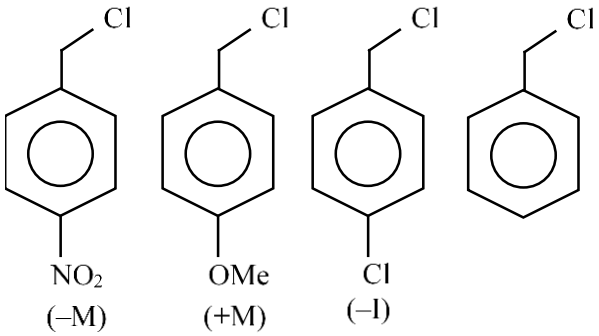
(1) a > c > d > b

(2) b > d > c > a

(3) $a > b > c > d$

(4) d > b > c > a

Sol. **2**



b > d > c > a

37. Which of the following reaction is correct?

(1) $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 2\,N_2O_4 + O_2$

(2) $2LiNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

(3) $2LiNO_3 \longrightarrow 2Li + 2NO_2 + O_2$

(4) $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

Sol. **4**

$4\ LiNO_3 \xrightarrow{\Delta} 2\ Li_2O + 4\ NO_2 + O_2$

38. Boric acid is solid, whereas BF_3 is gas at room emperature because of

(1) Strong van der Waal's interaction in Boric acid

(2) Strong covalent bond in BF_3

(3) Strong ionic bond in Boric acid

(4) Strong hydrogen bond in Boric acid

Sol. **4**

Due to strong hydrogen bonding present in boric acid, boric acid present in solid form.

39. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason **R**.

Assertion A: Antihistamines do not affect the secretion of acid in stomach.

Reason : Antiallergic and antacid drugs work on different receptors.

In the light of the above statements, choose the correct answer from the options given below:

(1) A is false but R is true

(2) Both A and R are true but R is not the correct explanation of A

(3) Both A and R are true and R is the correct explanation of A

(4) A is true but R is false

Sol. **3**

40. Formulae for Nessler's reagent is:

(1) HgI_2

(2) K_2HgI_4

(3) $KHgI_3$

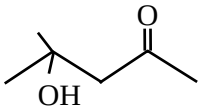
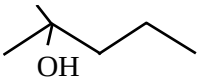
(4) KHg_2I_2

Sol. **2**

Nessler's reagent

$K_2HgI_4 + KOH$

41. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A:  can be easily reduced using Zn-Hg/HCl to 

Reason R: $Zn - Hg/HCl$ is used to reduce carbonyl group to $-CH_2-$ group.

In the light of the above statements, choose the correct answer from the options given below:

(1) A is true but R is false

(2) Both A and R are true and R is the correct explanation of A

(3) A is false but R is true

(4) Both A and R are true but R is not the correct explanation of A

Sol. **2**

42. Maximum number of electrons that can be accommodated in shell with n=4

(1) 16 (2) 32 (C) 72 (D) 50

Sol. **2**

Max e^- that can be accommodated in shell = $2n^2$

(n=4)

$2(4)^2=32$

43. The wave function (Ψ) of 2 s is given by

$\Psi_{2\,s} = \frac{1}{2\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{1/2}\left(2-\frac{r}{a_0}\right)e^{-r/2a_0}$

At $r = r_0$, radial node is formed. Thus, r_0 in terms of a_0

(1) $r_0 = 4a_0$

(2) $r_0 = \frac{a_0}{2}$

(3) $r_0 = a_0$

(4) $r_0 = 2a_0$

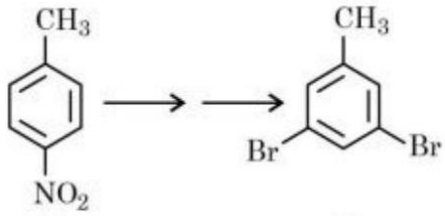
Sol. **4**

At node $\psi_{2s} = 0$

$2 - \frac{r_0}{a_0} = 0$

$r_0 = 2a_0$

44.



(X) (Y)

In the above conversion of compound (X) to product (Y), the sequence of reagents to be used will be:

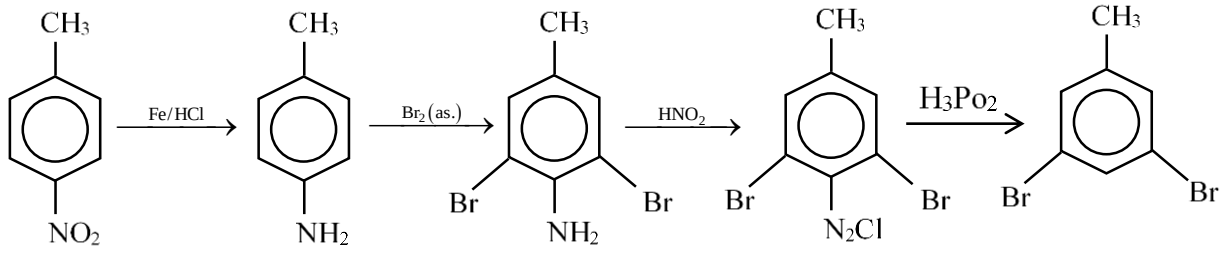
(1) (i) $Br_2(aq)$ (ii) $LiAlH_4$ (iii) H_3O^+

(2) (i) Br_2, Fe (ii) Fe, H^+ (iii) $LiAlH_4$

(3) (i) Fe, H^+ (ii) Br_2 (aq) (iii) HNO_2 (iv) H_3PO_2

(4) (i) Fe, H^+ (ii) Br_2 (aq) (iii) HNO_2 (iv) CuBr

Sol. **3**



45. Match List I with List II:

List I (Complexes)	List II (Hybridisation)
A. $[Ni(CO)_4]$	I. sp^3
B. $[Cu(NH_3)_4]^{2+}$	II. dsp^2
C. $[Fe(NH_3)_6]^{2+}$	III. sp^3d^2
D. $[Fe(H_2O)_6]^{2+}$	IV. d^2sp^3

(1) A-I, B-II, C-IV, D-III

(2) A-II, B-I, C-III, D-IV

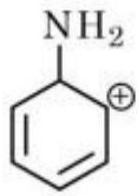
(3) A-II, B-I, C-IV, D-III

(4) A-I, B-II, C-III, D-IV

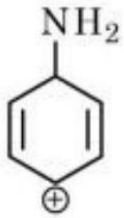
Sol. **1**

Complex	Hyloridisation
(A) $Ni(CO)_4$	sp^3
(B) $[Cu(NH_3)_4]^{+2}$	dsp^2
(C) $[Fe(NH_3)_6]^{+2}$	d^2sp^3
(D) $[Fe(H_2O)_6]^{+2}$	sp^3d^2

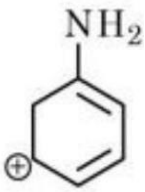
46. The most stable carbocation for the following is:



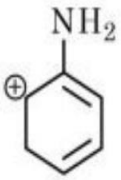
a



b



c



d

(1) a (2) c (3) d (4) b

Sol. **3**

47. Chlorides of which metal are soluble in organic solvents:

(1) K (2) Be (3) Mg (4) Ca

Sol. **2**

Due to smaller size, Be^{+2}. will show more polarising power, hence, Be will have maximum covalent character & most soluble in organic solvent.

48. $KMnO_4$ oxidises I^- in acidic and neutral/faintly alkaline solution, respectively, to

(1) IO_3^- & IO_3^-

(2) I_2 & IO_3^-

(3) I_2 & I_2

(4) IO_3^- & I_2

Sol. **2**

$2\ KMnO_4 + 10I^- + 16H^+ \rightarrow 2Mn^{+2} + 8H_2O + 5I_2$

neutral/faintly alkaline sol^n.

$2\ MnO_4^- + I^- + H_2O \rightarrow 2\ MnO_2 + 2OH^- + IO_3^-$

49. Bond dissociation energy of "E-H" bond of the "H_2E " hydrides of group 16 elements (given below), follows order.

A. O

B. S

C. Se

D. Te

Choose the correct from the options given below:

(1) B > A > C > D

(2) A > B > D > C

(3) A > B > C > D

(4) D > C > B > A

Sol. **3**

$H_2O > H_2S > H_2Se > H_2Te$

50. The water quality of a pond was analysed and its BOD was found to be 4. The pond has

(1) Highly polluted water

(2) Slightly polluted water

(3) Water has high amount of fluoride compounds

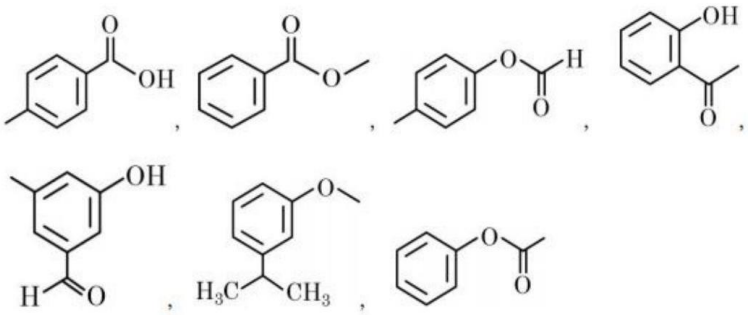
(4) Very clean water

Sol. **4**

Clean water have BOD value less than 5 ppm while highly polluted water have. BOD value of 17 ppm or more.

SECTION B

51. Number of compounds from the following which will not dissolve in cold $NaHCO_3$ and NaOH solutions but will dissolve in hot NaOH solution is



Sol. **3**

52. 1 mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. The work done is 3 kJ mol^{-1}. The final temperature of the gas is_____ K (Nearest integer). Given C_V = 20 J mol^{-1} K^{-1}

Sol. **150**

q = 0

$\Delta U = W = nC_v\Delta T$

$= 1 \times 20 \times [T_2 - 300] = -3000$

$= T_2 - 300 = -150$

$= T_2 = 150$ K

53. A short peptide on complete hydrolysis produces 3 moles of glycine (G), two moles of leucine (L) and two moles of valine (V) per mole of peptide. The number of peptide linkages in it are

Sol. **6**

54. Lead storage battery contains 38% by weight solution of H_2SO_4. The van't Hoff factor is 2.67 at this concentration. The temperature in Kelvin at which the solution in the battery will freeze is __ (Nearest integer). Given $K_f = 1.8$ K kg mol^{-1}

Sol. **243**

$\Delta T_f = i \cdot kf \cdot m$

$m = \frac{38}{98} \times \frac{1000}{62}$

$\Delta T_f = 2.67 \times 1.8 \times \frac{38}{98} \times \frac{1000}{62}$

$\Delta T_f = 30.05$

F.P. = 273 – 30 = 243 K

55. The strength of 50 volume solution of hydrogen peroxide is_____ g/L (Nearest integer).

Given:

Molar mass of H_2O_2 is 34 g mol^{-1}

Molar volume of gas at STP $= 22.7$ L.

Sol. **150**

Molarity = $\frac{\text{Volume Strength}}{11.35}$

Strength (g/lit) = Molarity × mol. Wt

$= \frac{50}{11.35} \times 34 == 150$ gm/lit

56. The electrode potential of the following half cell at 298 K

$X|X^{2+}(0.001M) \parallel Y^{2+}(0.01M)|Y$ is_____ $\times 10^{-2}$ V (Nearest integer).

Given: $E^0_{x^{2+}|X} = -2.36$ V

$E^0_{Y^{+2}|Y}$

$E^0Y^{2+1Y} = +0.36$ V

$\frac{2.303RT}{F} = 0.06$ V

Sol. **275**

$x + y^{+2} \rightarrow y + x^{+2}$

E^o Cell = $E^o_{Cathode} - E^o_{Anode}$

E^o Cell = 0.36 – (–2.36) = 2.72 V

$E_{Cell} = 2.72 - \frac{0.06}{2} \log \frac{x^{+2}}{y^{+2}}$

$E_{Cell} = 2.72 - \frac{0.06}{2} \log \frac{0.001}{0.01}$

= 2.72 + 0.03 = 2.75 V

= 275 × 10^{-2} V

57. An organic compound undergoes first order decomposition. If the time taken for the 60% decomposition is 540 s, then the time required for 90% decomposition will be is_____ s. (Nearest integer).

Given: $\ln 10 = 2.3; \log 2 = 0.3$

Sol. **1350**

$K = \frac{2.303}{540}\log\frac{100}{40}$

$K = \frac{2.303}{540} \times 0.4$

$t_{90} = \frac{2.303 \times 540}{2.303 \times 0.4}\log\frac{100}{10}$

$t_{90} = 1350$

58. Consider the following equation:

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g), \Delta H = -190$ kJ

The number of factors which will increase the yield of SO_3 at equilibrium from the following is

A. Increasing temperature

B. Increasing pressure

C. Adding more SO_2

D. Adding more O_2

E. Addition of catalyst

Sol. **3**

The yield of SO_3 at equilibrium will be due to:

B. Increasing pressure

C. Adding more SO_2

D. Adding more O_2

59. Iron oxide FeO, crystallises in a cubic lattice with a unit cell edge length of 5.0Å. If density of the FeO in the crystal is 4.0 g cm^{-3}, then the number of FeO units present per unit cell is_____ (Nearest integer)

Given: Molar mass of Fe and O is 56 and 16 g mol^{-1} respectively. $N_A = 6.0 \times 10^{23}$ mol^{-1}

Sol. **4**

$d = \frac{z \times M}{N_0 \times a^3}$

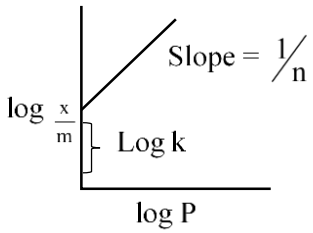
$4 = \frac{z \times 72}{6 \times 10^{23} \times 125 \times 10^{-24}}$

$Z = 4.166 \cong 4$

60. The graph of $\log\frac{x}{m}$ vs $\log p$ for an adsorption process is a straight line inclined at an angle of $45°$ with intercept equal to 0.6020. The mass of gas adsorbed per unit mass of adsorbent at the pressure of 0.4 atm is_____ $\times 10^{-1}$ (Nearest integer)

Given: $\log 2 = 0.3010$

Sol. **16**



Slope = tan 45° = 1

logK = 0.6020 = log 4

K = 4

$\frac{x}{m} = KP^{1/n}$

$\frac{x}{m} = 4(0.4)1 = 16 \times 10^{-1}$

मोशन है, तो भरोसा है।

#RankBhiSelectionBhi

ADMISSION ANNOUNCEMENT

Session 2023-24 (English & हिन्दी Medium)

Target: JEE/NEET 2025
Nurture & प्रयास Batch
Class 10th to 11th Moving

Target: JEE/NEET 2024
Enthuse & प्रयास Batch
Class 11th to 12th Moving

Target: JEE/NEET 2024
Dropper & प्रयास Batch
Class 12th to 13th Moving

Target: PRE FOUNDATION
SIP, Evening & Tapasya Batch
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